U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-260 054

COMPARISON OF DISSOLVED OXYGEN VALUES FIELD FIXATION VERSUS LATER LABORATORY DETERMINATIONS LOWER PLATTE RIVER BASIN

PUBLIC HEALTH SERVICE
KANSAS CITY, MISSOURI

PREPARED FOR
ENVIRONMENTAL HEALTH CENTER
CINCINNATI, OHIO

APRIL 1951

FS 2.2:
P69/4

: 2.2:
:9/4.

287029

PB 260 054

IV115
Smc 7 4/74

COMPARISON OF DISSOLVED OXYGEN VALUES

FIELD FIXATION VERSUS LATER LABORATORY DETERMINATIONS

LOWER PLATTE RIVER BASIN

RECEIVED
JUL 3 - 1951
MISSOURI RIVER BASIN OFFICE
U. S. PUBLIC HEALTH SERVICE

Library
Environmental Protection Agency
Region VII

FEDERAL SECURITY AGENCY
Public Health Service
Missouri Drainage Basin Office
Division of Water Pollution Control
and
Environmental Health Center

April, 1951

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

BIBLIOGRAPHIC DATA SHEET	1. Report No.	2.	3. Recipient's Accession No. PB-260 054
4. Title and Subtitle Comparison of Dissolved Oxygen Values Field Fixation Versus Later Laboratory Determinations, Lower Plate River Basin			5. Report Date Apr 51 6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Public Health Service, Kansas City, Mo. Missouri Drainage Basin Office			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Environmental Health Center, Cincinnati, Ohio			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstracts

A study conducted on the streams of the lower Platte River Basin found that the difference in value of the dissolved oxygen samples carried through to iodine stage in the field averaged about 0.06 ppm higher than the samples dosed later in the laboratory. However, it was concluded that the arithmetic mean of plus 0.06 is insignificant in view of the chance variation involved in the dissolved oxygen tests as conducted in the survey.

17. Key Words and Document Analysis. 17a. Descriptors

17b. Identifiers/Open-Ended Terms
*Dissolved oxygen
*Water pollution sampling
Platte River Basin

17c. COSATI Field/Group 13B

18. Availability Statement	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 10
	20. Security Class (This Page UNCLASSIFIED	22. Price

FORM NTIS-35 (REV. 10-73) ENDORSED BY ANSI AND UNESCO. THIS FORM MAY BE REPRODUCED USCOMM-DC 8265-P74

COMPARISON OF DISSOLVED OXYGEN VALUES FIELD FIXATION VERSUS LATER LABORATORY DETERMINATIONS LOWER PLATTE RIVER BASIN

INTRODUCTION

During the course of the lower Platte River Basin Water Pollution Investigation, 1949-1950, a special study was carried on by the Missouri Drainage Basin Office, Public Health Service, in cooperation with the Nebraska State Health Department. This study, conducted on the streams of the Lower Platte River Basin, was made to determine whether dissolved oxygen samples carried through to iodine stage in the field would give results significantly different from dissolved oxygen samples run in the laboratory without prior field treatment.

One hundred and forty-six pairs of dissolved oxygen samples were collected with one of each pair being dosed in the field. Samples fixed in the field were immediately carried through the iodine liberation stage and then transported to the laboratory for the titration. The companion samples were iced and then brought to the laboratory where the dissolved oxygen was determined immediately. The icing procedure consisted of placing the dissolved oxygen bottles in a regular cold drink insulated cooler but not in direct contact with the ice. The time that the samples were in transit was usually less than 6 hours, with the maximum time being 8 hours.

All dissolved oxygen determinations, utilizing the azide modification, were conducted according to "Standard Methods for the Examination of Water and Sewage," 9th Edition, 1946.

ANALYTICAL AND STATISTICAL RESULTS

Table 1 shows the distribution of dissolved oxygen differences by class means. Dissolved oxygen differences were obtained by subtracting the dissolved oxygen content of the laboratory sample from the dissolved oxygen content of the field sample (D. O. Field minus D.O. Lab). A negative value indicates greater dissolved oxygen in the laboratory sample whereas a positive value indicates a greater dissolved oxygen control in the field-treated sample. Figure 1 shows the normal curve as compared to the actual sample distribution curve. A summary of the statistical results are as follows:

N - Number of items (Number of differences)	= 146
M - Arithmetic Mean Difference	= + 0.06 ppm
σ - Standard Deviation of the Differences	= $\pm$ 0.29 ppm
σ_M - Standard Deviation of the Mean Difference	= $\pm$ 0.024 ppm
B_2 - Degree of Kurtosis	= 8.8

TABLE I

DISSOLVED OXYGEN DIFFERENCES BETWEEN

LABORATORY AND FIELD TESTS

(Difference = (D.O.Field - D.O.Lab.)

CLASS MEAN	FREQUENCY	-	CLASS MEAN	FREQUENCY
			+ 1.4 ppm	1
			1.3	0
- 1.2 ppm	1		1.2	0
- 1.1	1		1.1	1
- 1.0	0		1.0	0
- 0.9	0		0.9	0
- 0.8	1		0.8	0
- 0.7	0		0.7	0
- 0.6	0		0.6	3
- 0.5	2		0.5	3
- 0.4	1		0.4	4
- 0.3	5		0.3	10
- 0.2	6		0.2	20
- 0.1	17		0.1	36
0.0	34			

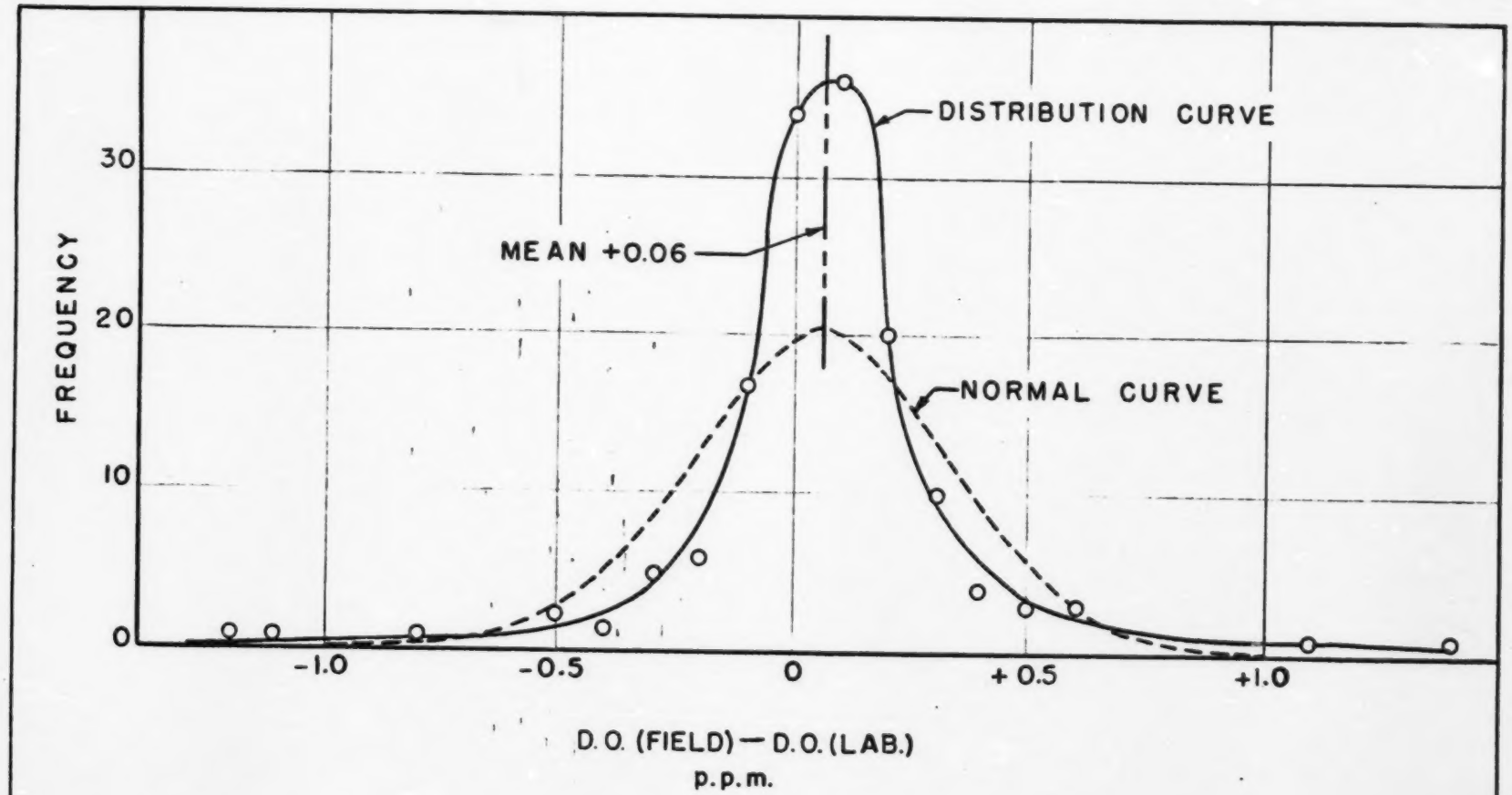

FIGURE 1

DISTRIBUTION OF DISSOLVED OXYGEN VARIATIONS

DISCUSSION

A comparison of the difference in value of the dissolved oxygen content of the samples indicates only a small difference in the majority of cases. The arithmetic mean of the differences was approximately + 0.06 ppm which means that the samples dosed in the field averaged about 0.06 ppm higher in dissolved oxygen than the samples dosed later in the laboratory. The standard deviation and probable error, computed from these data were $\pm$ 0.29 ppm and $\pm$ 0.20 ppm, respectively. Thus, in accordance with the law of chance, 68% of the sample difference could be expected to fall between + 0.35 and - 0.23 and 50% between + 0.26 ppm and - 0.14 ppm. It is, therefore, concluded that the arithmetic mean of + 0.06 is insignificant in view of the chance variation involved in the dissolved oxygen tests as conducted in this survey.

In analyzing the results obtained from the 146 paired samples, a distribution curve and normal curve of identical parameters (mean and standard deviations) were prepared (See Figure 1). The distribution curve is nearly symmetrical and similar to the normal curve. The "goodness of fit" of the frequency distribution to the normal curve was tested by the Chi Square Test and this confirmed what is indicated graphically in Fig. 1, that the normal curve is not a good description of the series. As mentioned previously, for normal distribution, approximately 68% of the values would be expected to fall within the range of + 0.35 ppm and - 0.23 ppm. However, the distribution curve obtained from the survey data included 84% of the samples within this range. This variation is due to the peaked distribution of the curve. Such a distribution is referred to as "leptokurtic." The magnitude of this property is measured by the degree of Kurtosis. This expression has a value of 3.0 for the normal curve, less than 3.0 for a flat-topped

Environmental Protection Agency
Region VII

curve, and greater than 3.0 for a peaked curve. For the distribution curve obtained from the survey data, this value is 8.8.

SUMMARY AND CONCLUSIONS

The arithmetic mean of the differences between the dissolved oxygen content of the field samples minus the dissolved oxygen content of the laboratory samples was +0.06 ppm or samples fixed in the field on the average were 0.06 ppm higher. The standard deviation and probable error of the differences were $\pm$ 0.29 ppm and $\pm$ 0.20 ppm respectively. Thus, due to the probable error inherent to this set of data a random difference might be expected to fall within a range of + 0.26 ppm to - 0.14 ppm 50% of the time. It was concluded for the streams of the Lower Platte River Basin, that there was apparently no significant difference in dissolved oxygen results obtained from samples carried through to iodine liberation in the field or later in the laboratory.

However, it should be emphasized that where the temperature or time of transit are appreciably different from the conditions of this study, or where the stream is highly polluted, significant differences might be obtained between the two methods of determining dissolved oxygen.

REVIEWERS' NOTE

This presentation has been reviewed by Messrs. Ruchhoft and Moore. Their comments included an important supplement to this discussion and these comments are quoted in part as follows:

"On a highly polluted stream if the dissolved oxygen samples are carried through to iodine liberation, a higher loss of dissolved oxygen would be encountered than if the samples are transported to the laboratory

iced (or acidified)* and the dissolved oxygen test made there. This is due to the fact that iodine is a much better oxidizing agent in acid solution than is dissolved oxygen.

* See "Standard Methods" 9th Edition page 125, paragraphs 3 and 4.